Having described the invention we claim

1.   A distributed data processing system for controlling allocation of resources and task execution and comprising:

a communications network for passing messages between computers connected thereto;

a plurality of computers connected to said network for running programs thereon including a central authority and at least first and second autonomous agents;

said central authority generates a graph associated with each agent wherein the graph represents for the associated agent what resources that agent has and what task or tasks that agent may perform;

each said agent employs the associated said graph to determine what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,

said agents negotiate with each other for the resources needed to carry out the task or tasks to be performed by said agents.

2.   A system as set forth in claim 1 wherein said central authority generates said graphs from received data including data representing models of tasks mapped to task types.

3.   A system as set forth in claim 1 wherein said central authority generates said graphs from received data including data representing number and type of resources.

4.   A system as set forth in claim 1 wherein said central authority generates said graphs from received data including data representing types and number of tasks.

5.   A system as set forth in claim 4 wherein said received data further includes data representing models of tasks mapped to task types and data representing number and type of resources.

6.   A system as set forth in claim 1 wherein said central authority receives data including data representing mission constraints including linear inequalities in terms of resources and tasks results.

7.   A system as set forth in claim 6 wherein said central authority generates supervisory control structure to enforce constraint dependencies based on received data including that representing mission constraints and said graphs.

8.   A system as set forth in claim 1 wherein said central authority receives data including data representing mission constraints including linear inequalities in terms of resources and tasks results.

9.   A system as set forth in claim 8 wherein said central authority generates supervisory control structure to enforce constraint dependencies based on received data including that representing mission constraints and said graphs.

10.   A system as set forth in claim 9 wherein said received data further includes data representing models of tasks mapped to task types and data representing number and type of resources and types and numbers of tasks.

11.   A system as set forth in claim 1 wherein said central authority receives data representing mission objectives described in terms of rewards associated with task results and basic resource costs.

12.   A system as set forth in claim 11 wherein said central authority assigns penalties for resource consumption and rewards for all subtask results based on data received including that representing mission objectives.

13. A system as set forth in claim 12 wherein said central authority receives data representing locations of potential agent processors and locations of resources and potential task implementers.

14. A system as set forth in claim 13 wherein said central authority decomposes an overall model for distribution among the individual agents.

15. A system as set forth in claim 14 wherein said central authority determines if any agent has not received initial data and if not, then it sends the structure and initial conditions, task and resource mappings and the number and type of resources to that agent.

16. A system as set forth in claim 15 wherein said central authority determines if any agents have not been updated and if so it sends to any such non-updated agent the resources, usage costs and task completion reward.

17. A system as set forth in claim 16 wherein said central authority receives incoming agent messages and provides user feedback.

18. A system as set forth in claim 17 wherein said central authority determines whether the mission has been completed.

19.   A method operative in a distributed data processing system for controlling allocation of resources and task execution and employing a communications network for passing messages between computers connected thereto and wherein said computers are operative to run programs thereon including a central authority and at least first and second autonomous agents comprising the steps of:

at said central authority, generating a graph associated with each agent and representing for that agent what resources that agent has and what task or tasks that agent may use the resources for;

each said agent employing the associated said graph for determining what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,

said agents negotiating with each other for the resources needed to carry out the task or tasks to be performed by said agents.

20.   A method as set forth in claim 19 wherein said step of generating said graphs includes generating said graphs from received data including data representing models of tasks mapped to task types.

21.   A method as set forth in claim 20 wherein said step of generating a graph includes generating said graph from data representing number and type of resources.

22.   A method as set forth in claim 21 wherein said step of generating said graphs from received data includes data representing models of tasks mapped to task types.

23.   A method as set forth in claim 19 wherein said central authority generates supervisory control structure to enforce constraint dependencies based on received data including data representing linear inequalities in terms of resources and task results representing mission constraints.

24.   A method as set forth in claim 23 wherein said central authority assigns penalties for resource consumption and rewards for all subtask results based on received data including data representing mission objectives described in terms of rewards associated with task results and basic resource costs.

25.   A method as set forth in claim 24 wherein said central authority decomposes an overall graph for distribution among individual agents based on received data including data representing locations of potential agent processors and locations of resources and potential task implementers.

26.   A method as set forth in claim 25 including the step of determining whether any agents were not initialized and if not, then for a non-initialized agent sending its structure and initial conditions, task and resource mappings and the number and type of resources to that agent.

27.   A method as set forth in claim 26 including the step of determining whether any agents have not been updated and for each non-updated agent, sending to that agent the resource usage cost and task completion reward data.

28.   A method as set forth in claim 27 including the step of receiving incoming agent messages and then providing user feedback data and then determining whether the mission has been completed.

29.   A computer program product operative in a distributed data processing system for controlling allocation of resources and task execution wherein the system includes a communications network for passing messages between computers connected thereto and wherein said computers are connected to said network for running programs thereon including a central authority and at least first and second autonomous agents; and comprising:

a central authority that generates a graph associated with each agent wherein the graph represents for the associated agent what

resources that agent has and what task or tasks that agent may use the resources for;

first and second agents, each said agent employs the associated said graph to determine what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,

said first and second agents negotiate with each other for the resources needed to carry out the task or tasks to be performed by said agents.

30.   A product as set forth in claim 29 wherein said central authority generates said graphs from received data including data representing models of tasks mapped to task types.

31.   A product as set forth in claim 29 wherein said central authority generates said graphs from received data including data representing number and type of resources.

32.   A product as set forth in claim 29 wherein said central authority generates said graphs from received data including data representing types and number of tasks.

33.   A product as set forth in claim 32 wherein said received data further includes data representing models of tasks mapped to task types and data representing number and type of resources.

34.   A product as set forth in claim 29 wherein said central authority receives data including data representing mission constraints including linear inequalities in terms of resources and tasks results.

35.   A product as set forth in claim 34 wherein said central authority generates supervisory control structure to enforce constraint dependencies based on received data including that representing mission constraints and said graphs.

36.   A product as set forth in claim 29 wherein said central authority receives data including data representing mission constraints including linear inequalities in terms of resources and tasks results.

37.   A product as set forth in claim 36 wherein said central authority generates supervisory control structure to enforce constraint dependencies based on received data including that representing mission constraints and said graphs.

38.   A product as set forth in claim 36 wherein said received data further includes data representing models of tasks mapped to task types and data representing number and type of resources.

39.   A product as set forth in claim 29 wherein said central authority receives data representing mission objectives described in terms of rewards associated with task results and basic resource costs.

40.   A product as set forth in claim 39 wherein said central authority assigns penalties for resource consumption and rewards for all subtask results based on data received including that representing mission objectives.

41.   A product as set forth in claim 40 wherein said central authority receives data representing locations of potential agent processors and locations of resources and potential agent processors and locations of resources and potential task implementers.

42.   A product as set forth in claim 41 wherein said central authority decomposes an overall PN model for distribution among the individual agents.

43.   A product as set forth in claim 42 wherein said central authority determines if any agent has not received initial data and if not, then it sends the structure and initial conditions task and resource mappings and the number and type of resources to that agent.

44.   A product as set forth in claim 43 wherein said central authority determines if any agents have not been updated and if so it sends to any such non-updated agent the resources usage costs and task completion reward.

45.   A product as set forth in claim 44 wherein said central authority receives incoming agent messages and provides user feedback.

46.   A product as set forth in claim 45 wherein said central authority determines whether the mission has been completed.